

# PATENT SPECIFICATION

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DRAWINGS ATTACHED

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## (54) PATTERNED COATING ON A SUBSTRATE

(71) We, TELCON METALS LIMITED, a company organised under the laws of Great Britain, of P.O. Box No. 12 Manor Royal, Crawley, Sussex, England, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to a method of providing a conductive or semi-conductive metal pattern on a conductive or semi-conductive substrate.

The method is useful in providing a more highly conductive path on a metal substrate. Alternatively, the method is useful in providing a metal pattern on a metal substrate to facilitate joining of another metal member thereto such as by welding, soldering and the like. The method can also be used for depositing a conductive pattern on a semiconductive material such as in the production of integrated and thin film circuits. The pattern can of course provide a different conductivity as well as provide a more suitable surface for joins by welding or soldering.

According to the method of this invention a surface coating of a conductive or semi-conductive metal in a finely divided condition is applied to a substrate, following which pressure sufficient to produce bonding between the coating and the substrate by cold welding is applied to the coated substrate over a selected area or areas corresponding to a required pattern, whereafter excess metal is removed.

The resultant substrate with its coating may then be subjected to heat treatment in a furnace in order to consolidate the pattern applied thereto. The heat treatment is carried out by sintering at a temperature as high as possible, but below the melting point of the coating or of the substrate.

45 An example of the invention is described [Price 25p]

with reference to the accompanying drawing which illustrates an integrated circuit lead frame to which a semiconductor chip is connectable by for example, gold or aluminium lead wires welded or soldered to the inner ends of radial finger portions.

A composite strip 1 used for the production of the lead frames 2 is normally made of a controlled expansion nickel-iron alloy about 1" wide by 0.010" thick. A central band of aluminium 3 approximately 0.15" wide, 0.0002" thick, is bonded to the surface of the alloy. We manufacture such a composite strip in a continuous manner as follows:—

A steel strip is drawn through a suspension of fine aluminium powder in alcohol, and a thin layer of powder is deposited, on one or both sides of the strip, by electrophoresis. The strip, after drying, is then passed between two rolls, one or each of which is provided with a raised pattern, the rolls being set to give the desired pressure. After removing excess powder, the strip is finally passed through a sintering furnace, preferably in the presence of a controlled atmosphere.

The invention is, of course, not limited to the foregoing example. The powder and the substrate may consist of a conductive, or semi-conductive material or mixtures thereof; it can even be the same as the substrate. It may be deposited not only by electrophoresis, but also by other suitable methods. Such other methods may include painting on powdered metal supported in a suitable binder, or even laying a powdered metal coating or pattern on a substrate which is undisturbed before applying cold welding pressure. In place of a strip or tape, the substrate may consist of a sheet or thin foil and the pattern can be imprinted under a press, or by any suitable method, provided that the pressure is high enough to bring about cold welding.

## WHAT WE CLAIM IS:—

1. A method of applying a patterned surface coating of a conductive or semi-conductive metal to a substrate comprising the steps of applying conductive or semi-conductive metal in a finely divided condition to a substrate, applying pressure sufficient to produce bonding between the coating and the substrate by cold welding over a selected area or areas corresponding to a required pattern, and removing the excess unbonded coating from the substrate.

2. A method as claimed in claim 1 in which the substrate with the coating bonded thereto is subjected to heat to consolidate the pattern.

3. A method as claimed in claim 3 in which the heating is carried out by sintering at a temperature close to, but below, the melting point of the coating or the substrate.

4. A method as claimed in any one of claims 1-3 in which the coating is initially applied by electrophoresis, the substrate being immersed in a suspension of conductive or semi-conductive metal powder.

5. A method as claimed in claim 4 in which the powdered metal is suspended in alcohol.

6. A method as claimed in either claim 4 or 5 in which the substrate is dried and then passed between rolls at least one of which is provided with a raised pattern, the rolls being set to give the desired pressure.

7. A method as claimed in any one of the preceding claims when using powdered aluminium as the conductive metal.

8. A method as claimed in any one of the preceding claims in which the substrate is a lead frame for a semi-conductor chip and a band of metal powder, the conductivity of which is higher than that of the lead frame, is applied to parts of the lead frame to facilitate welding of lead wires to said parts.

9. A substrate coated with a conductive or semi-conductive metal according to the method claimed in any one of claims 1-8.

10. A lead frame for a semiconductor chip coated with a conductive metal according to the method claimed in any one of claims 1-8.

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COMPLETE SPECIFICATION

*This drawing is a reproduction of  
the Original on a reduced scale.*

